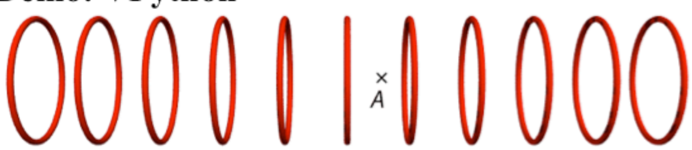
Mar 4

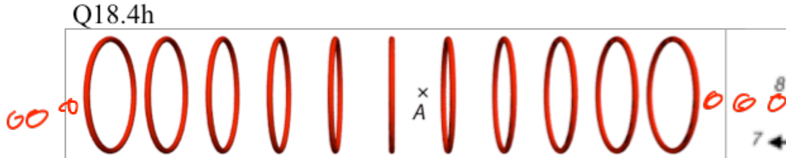
FIND NEW GROUPS

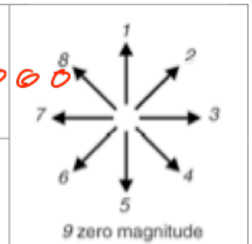
Get Clickers and kits

Demo: VPython



Q18.4h



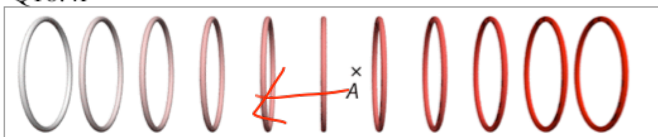


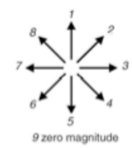
Surface of wire coated with uniform charge. Red = positive. (Rings of charge are shown.)

Direction of electric field at location A?

A) 1
B) 3
C) 5
D) 7
E) 9

Q18.4i



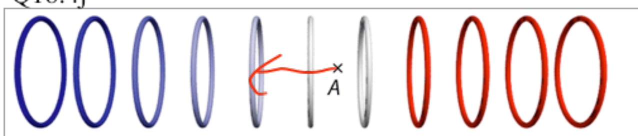


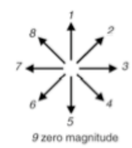
Surface of wire coated with gradient of charge.
Red = positive; Gray = neutral.
(Rings of charge are shown.)

Direction of electric field at location A?

A) 1
B) 3
C) 5
D) 7
E) 9

Q18.4j



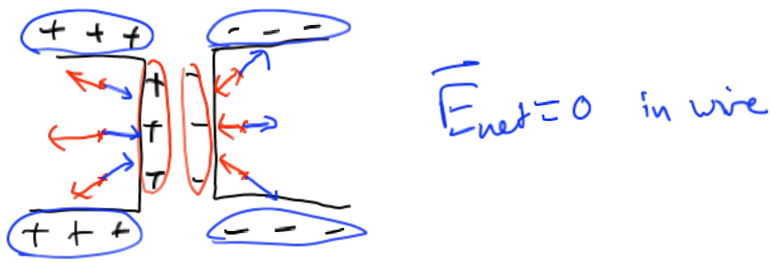


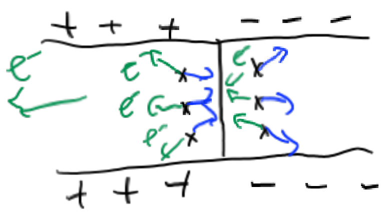
Surface of wire coated with gradient of charge.
Red = positive, Blue = negative, Gray = neutral.
(Rings of charge are shown.)

Direction of electric field at location A?

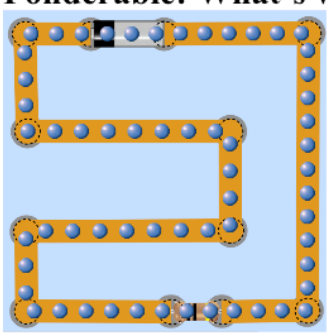
A) 1
B) 3
C) 5
D) 7
E) 9

Ponderable: Connecting wires

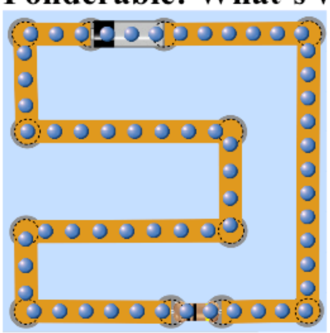


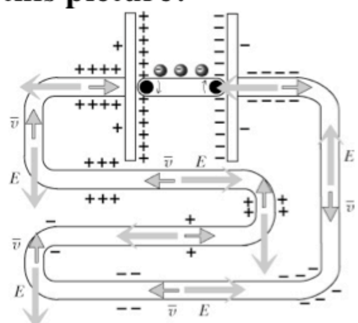


Ponderable: What's wrong with this picture?

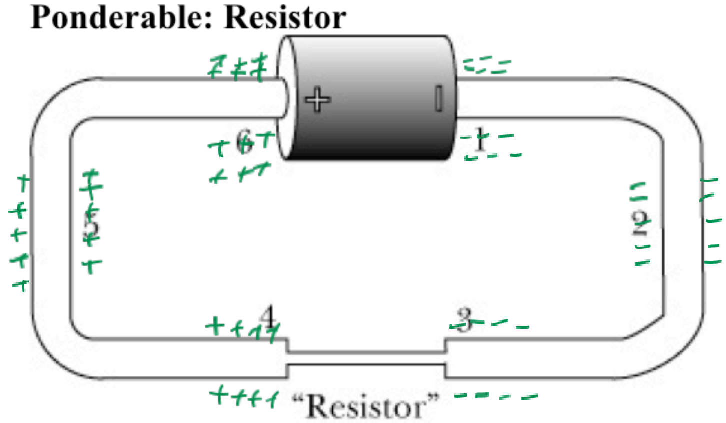


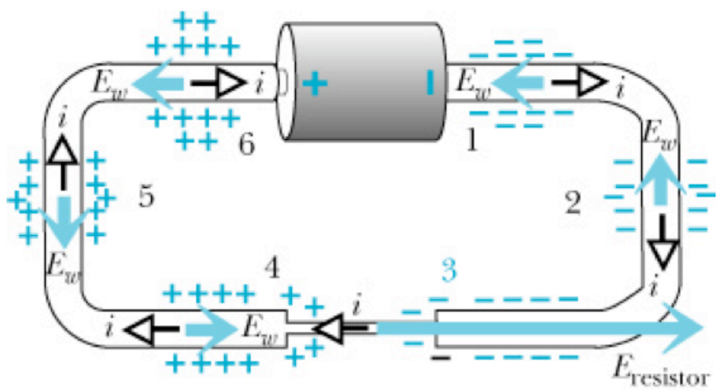
Ponderable: What's wrong with this picture?





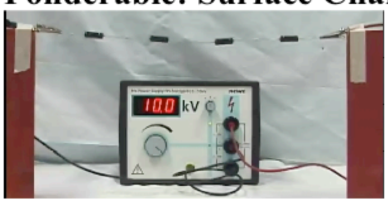
Ponderable: Resistor





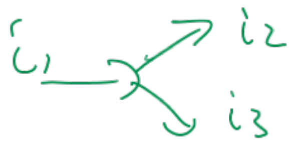
E_w
i
1
2
3
4
5
6
$E_{resistor}$

Ponderable: Surface Charge Movie



Discuss

$\Delta V = 0$ around closed loop



$i_1 = i_2 + i_3$

Ponderable: Potential difference

Loop Me

Ponderable: Similar terms

1) Static Equilibrium: no current flowing

$\vec{E} = 0$ inside conductor

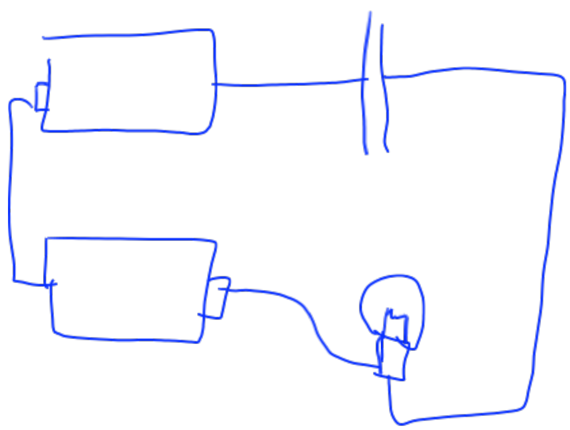
2) Steady State: current flowing steadily (not changing in time)

$\vec{E} \neq 0$ inside conductor where current flowing

3) Transient: time between the other two

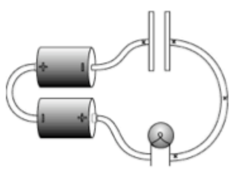
i and E non zero and changing with time

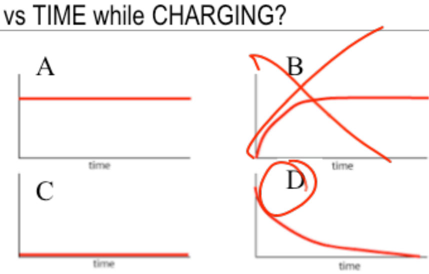
Tangible: An open circuit



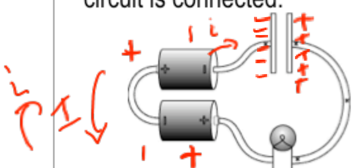
Q19.1c Which graph shows CURRENT vs TIME while CHARGING?

Capacitor initially uncharged.

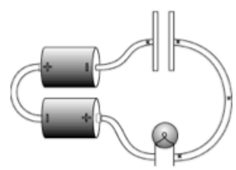


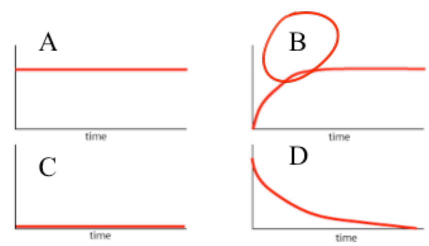


Q19.1d

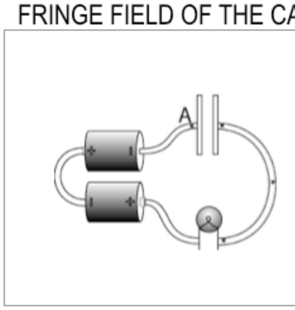
Capacitor initially uncharged. When circuit is connected: 	A) Electrons jump across the gap between the plates. B) Electrons pile up on the left plate. C) Electrons pile up on the right plate.

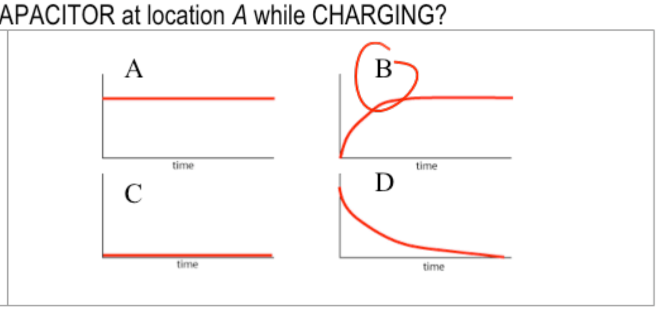
Q19.1e Capacitor initially uncharged. Which graph shows MAGNITUDE of CHARGE on RIGHT PLATE vs. time while charging?



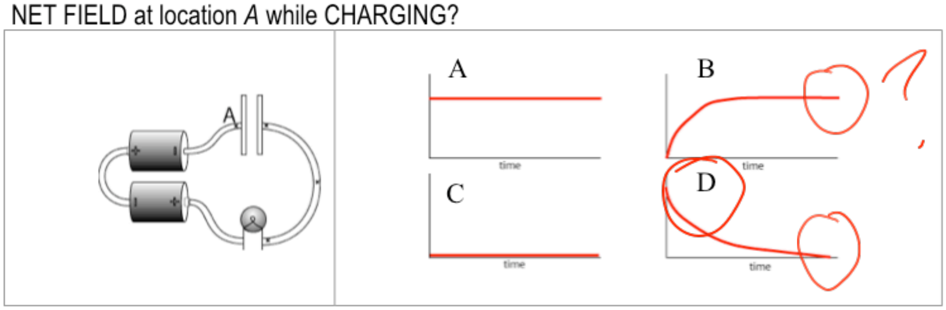


Q19.1f Capacitor initially uncharged. Which graph shows the magnitude of the FRINGE FIELD OF THE CAPACITOR at location *A* while CHARGING?



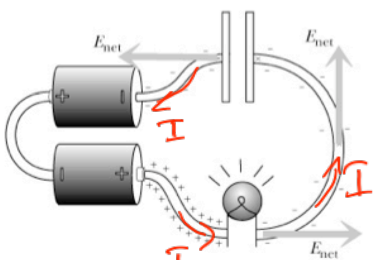


Q19.1g Capacitor initially uncharged. Which graph shows the magnitude of the NET FIELD at location *A* while CHARGING?



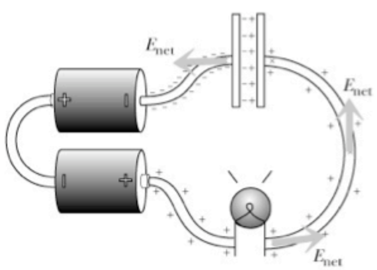
$i = nAuE$

Ponderable: Slow mo for charging a capacitor



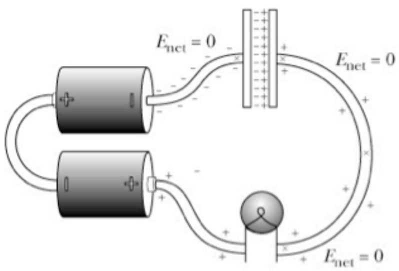
t = 0.1 s after starting
(initial brightness)

transient



t = 1 s after starting
(medium brightness)

"quasi steady-state"
change is slow compared
to time we are looking at



t = 100 s after starting
(bulb is not glowing)

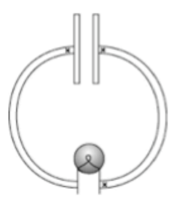
Static equilibrium

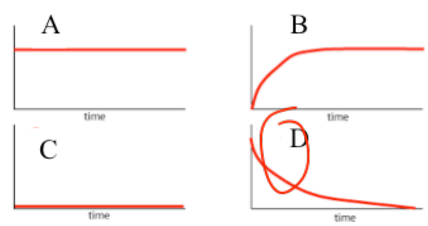
Tangible: An open circuit without a battery!

I'm All Charged Up

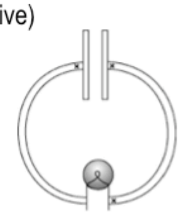
Clicker Questions:

Q19.1a Capacitor initially charged. Which graph shows CURRENT vs TIME while DISCHARGING?

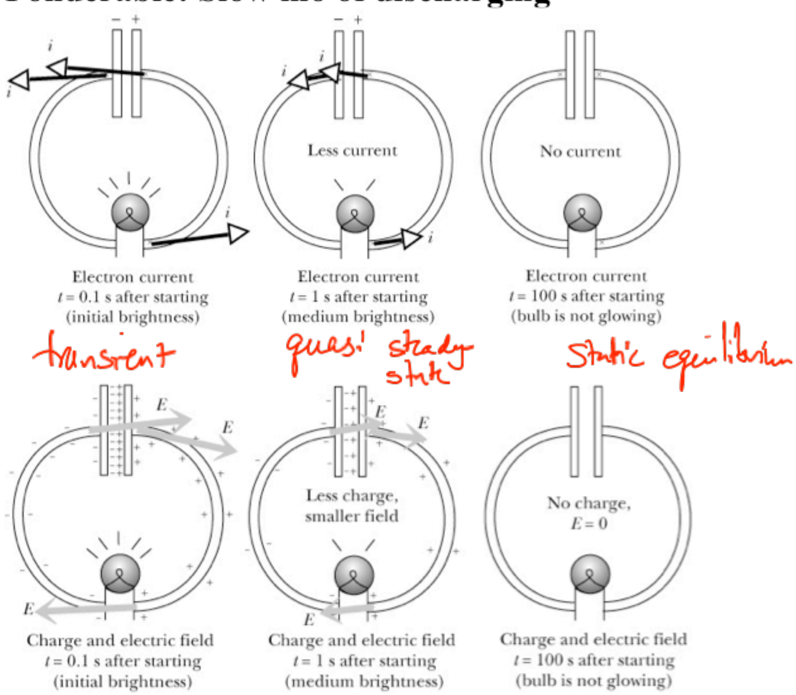




Q19.1b

Capacitor initially charged (left plate negative)	When circuit is connected:
	A) Charge on the plates stays constant. B) Left plate gets less negative. C) Left plate gets more negative.

Ponderable: Slow mo of discharging



Discussions: Error Bars

Discussion: Capacitance

$Q \propto \Delta V$

↑ proportional to

$E = \frac{Q/A}{\epsilon_0}$

$Q = C \Delta V$

$\Delta V = -\int \vec{E} \cdot d\vec{l}$

$= Ed$

$C = \frac{Q}{\Delta V} = \frac{Q}{Ed} = \frac{\cancel{Q}}{\frac{\cancel{Q}A}{\epsilon_0} d}$

$C = \frac{\epsilon_0 A}{d}$ Capacitance units of $\frac{C}{V}$ = Farad